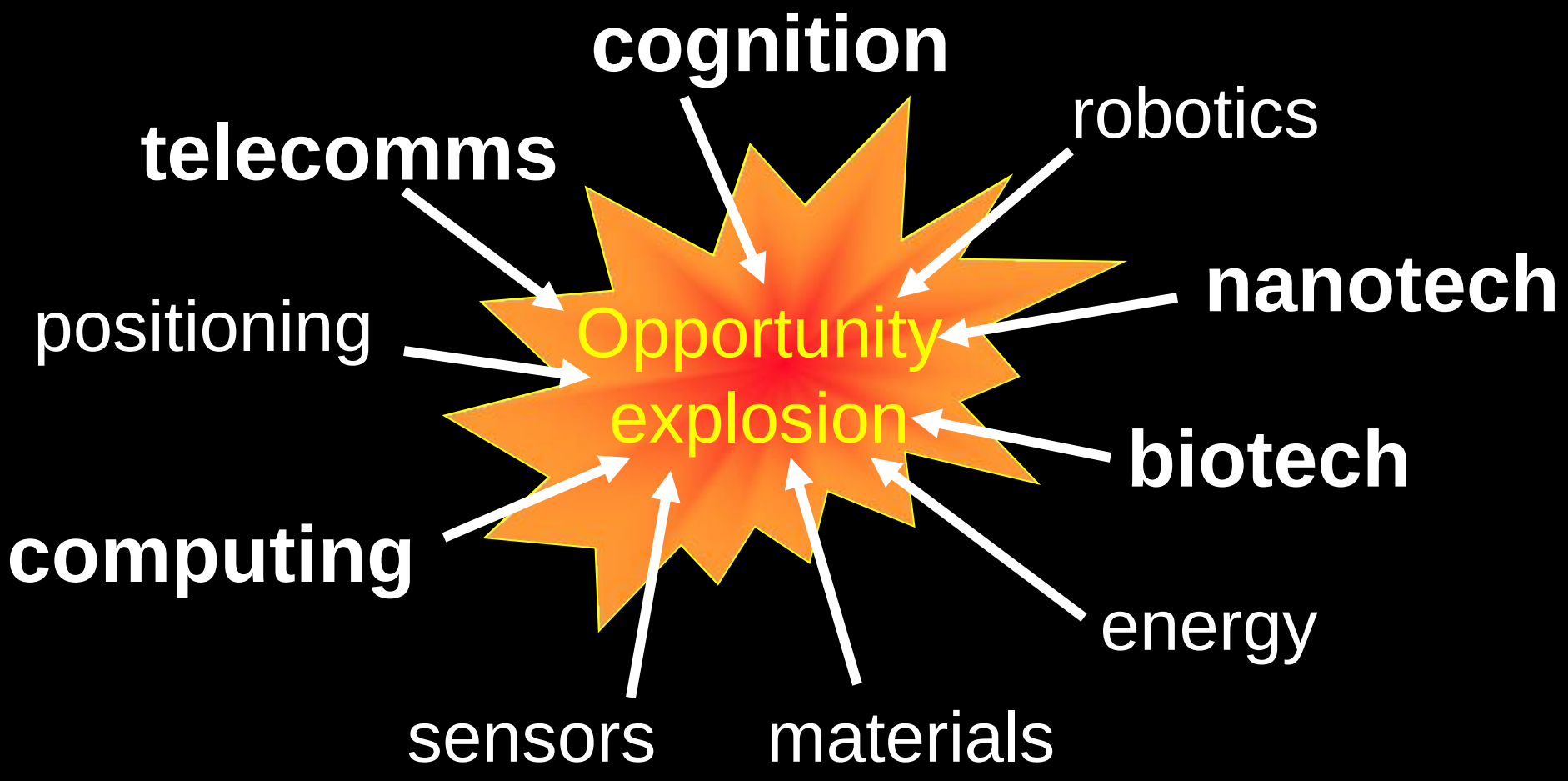
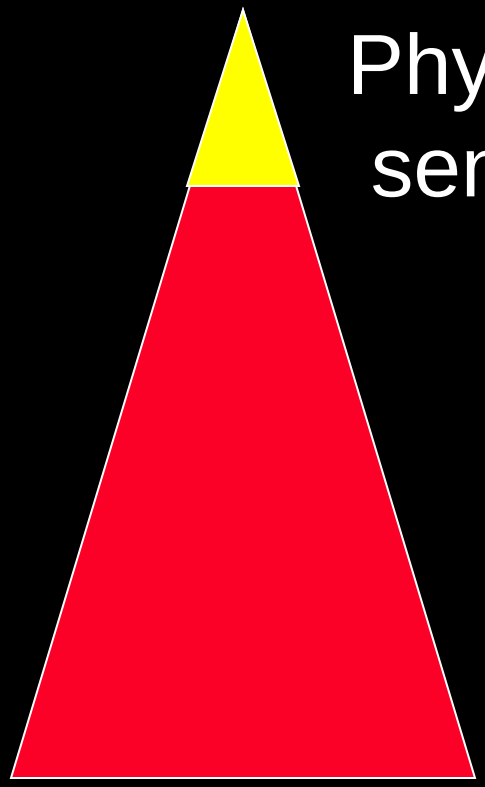
I Pearson

Towards machine consciousness and man-machine convergence

Ongoing convergence - NBIC+



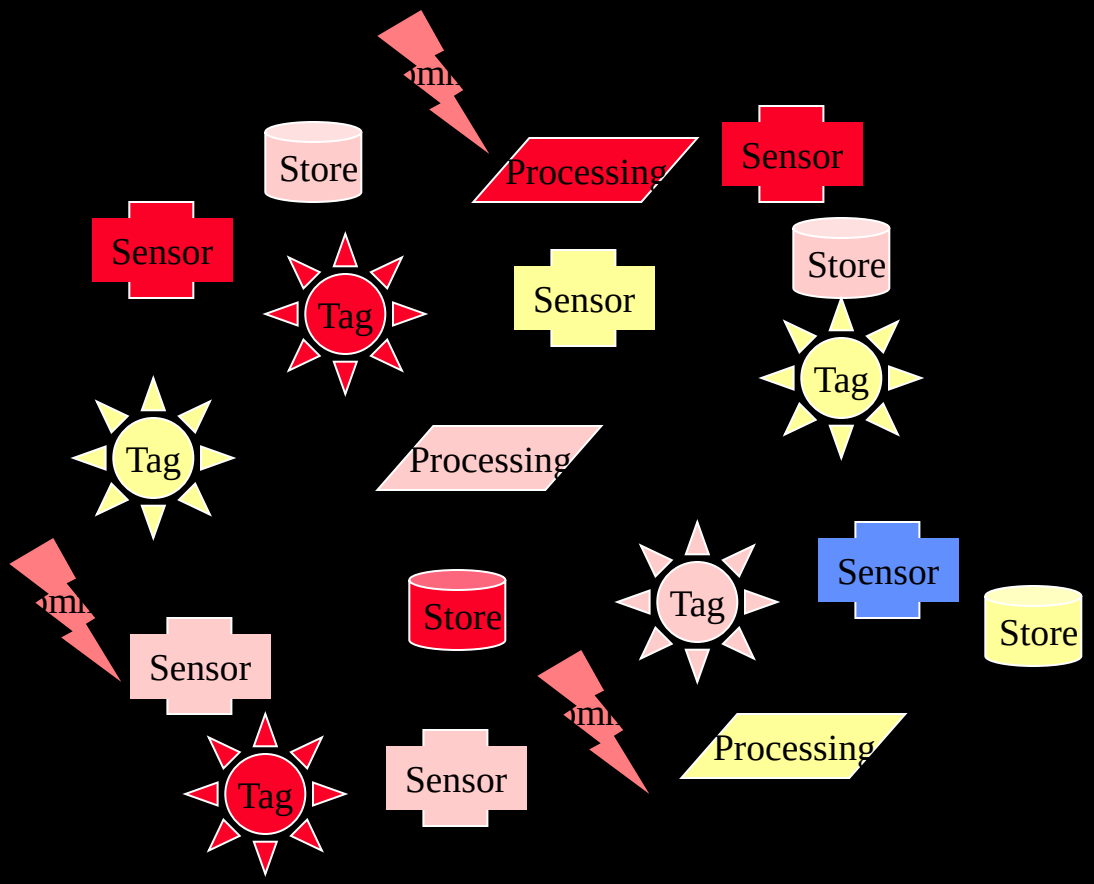
Ubiquitous & Pervasive computing
Ambient intelligence



Physical -tags, activators, sensors

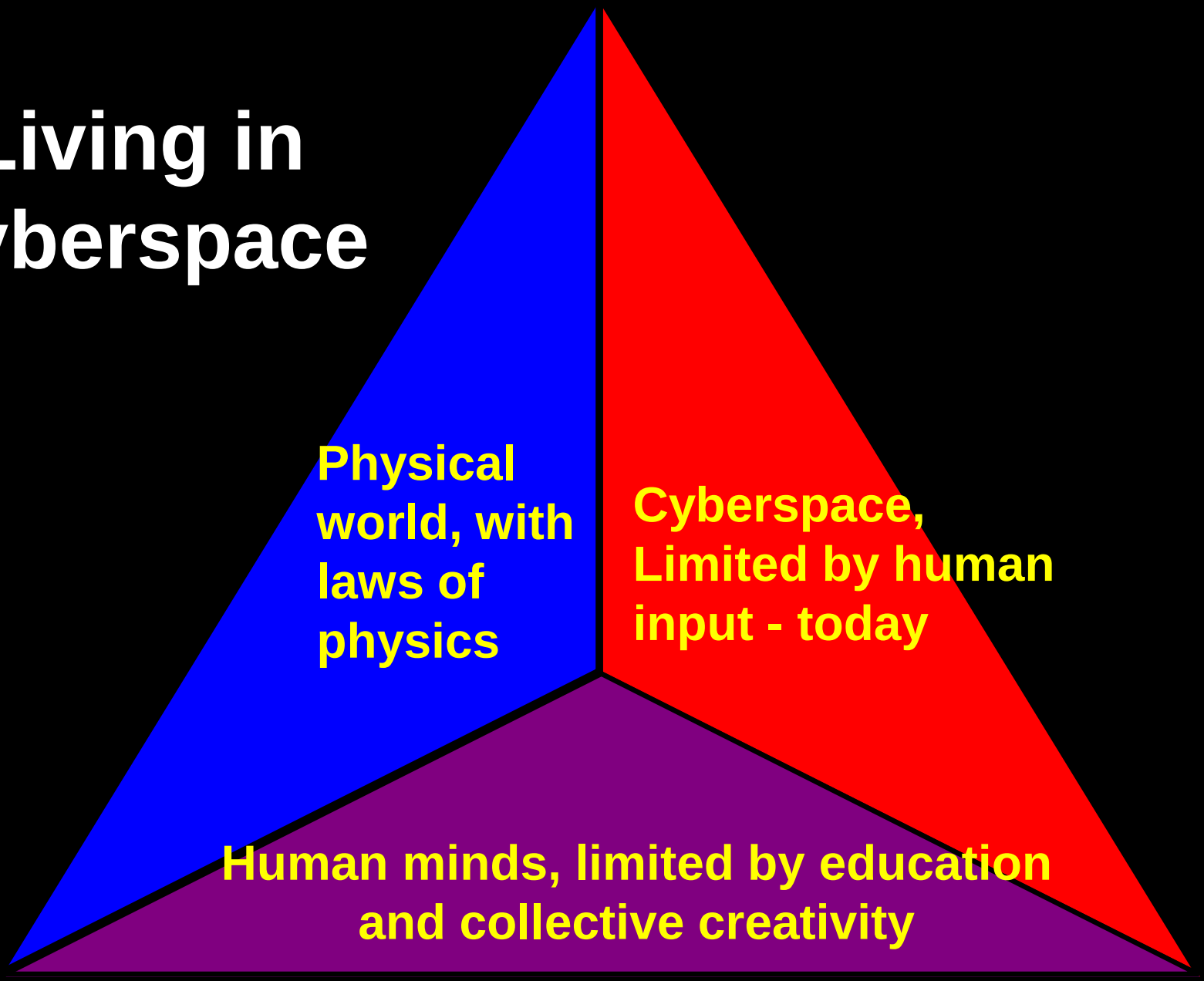
Cyberspace - data, algorithms, services

Activators - smart environments



Urban environment will be peppered with processors, tags, data stores, sensors and communicators.

Living in Cyberspace



Cyberspace - humans

- Humans inhabit physical world
- The mind runs on the physical brain but is effectively a separate domain
  - Notion of self
  - Imagination
  - Culture
  - Relationships
- Cyberspace used as a simple electronic overlay with very primitive development

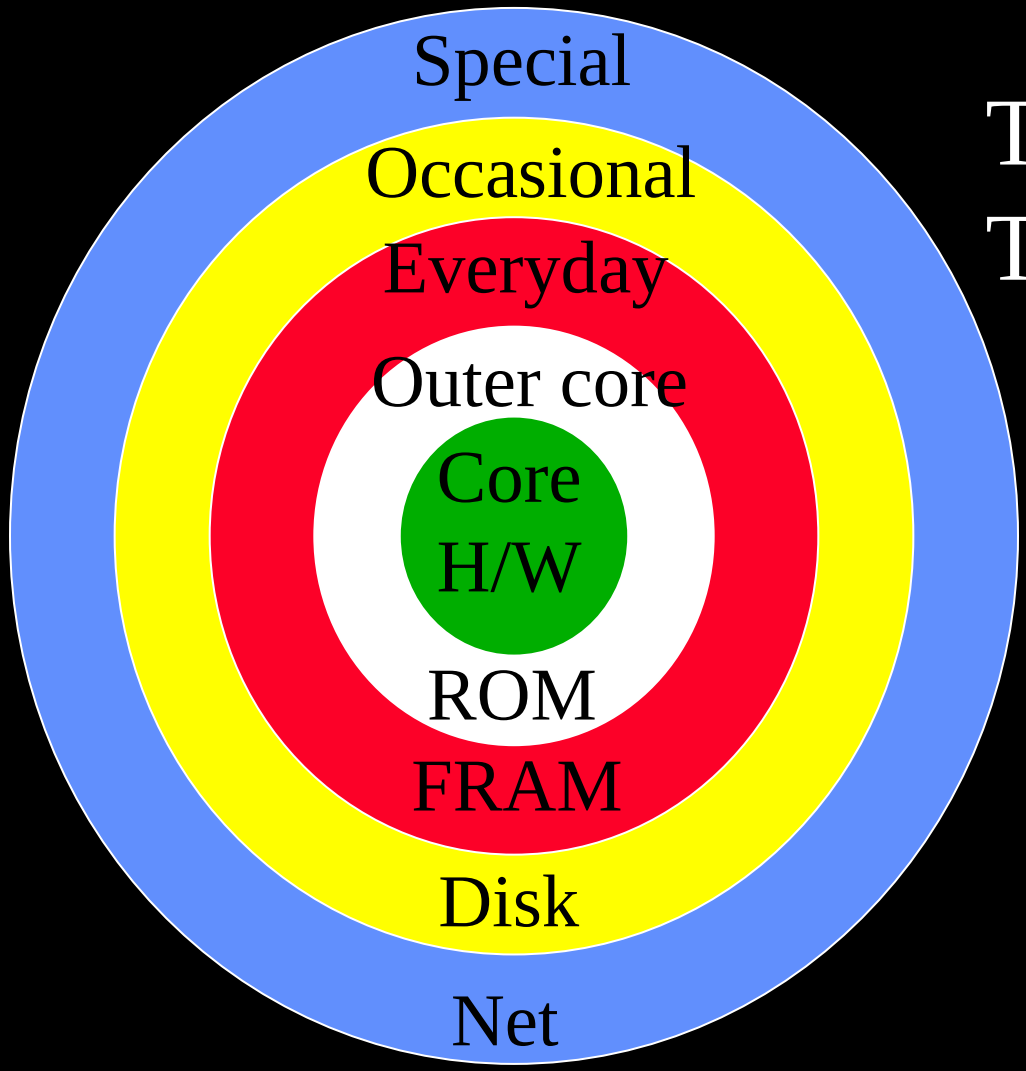
Cyberspace - computers

- Computers, sensors, networks, data stores etc inhabit physical world
- Cyberspace runs on the physical kit but is effectively a separate domain
  - Machines have no notion of self, yet
  - No imagination, yet
  - No culture, yet
  - No relationships, yet

Ultra foundations

- Multi-layered just-in-time OS, not just-in-case
- Uses many cheap, simple devices with self organisation to make a ubiquitous smart environment
- Strong emphasis on sensory platform, both external and internal, real world and cyberspace sensing
- Maximal use of emergence and evolution
- Cyberspace environment using highly customised physics to enable emergence

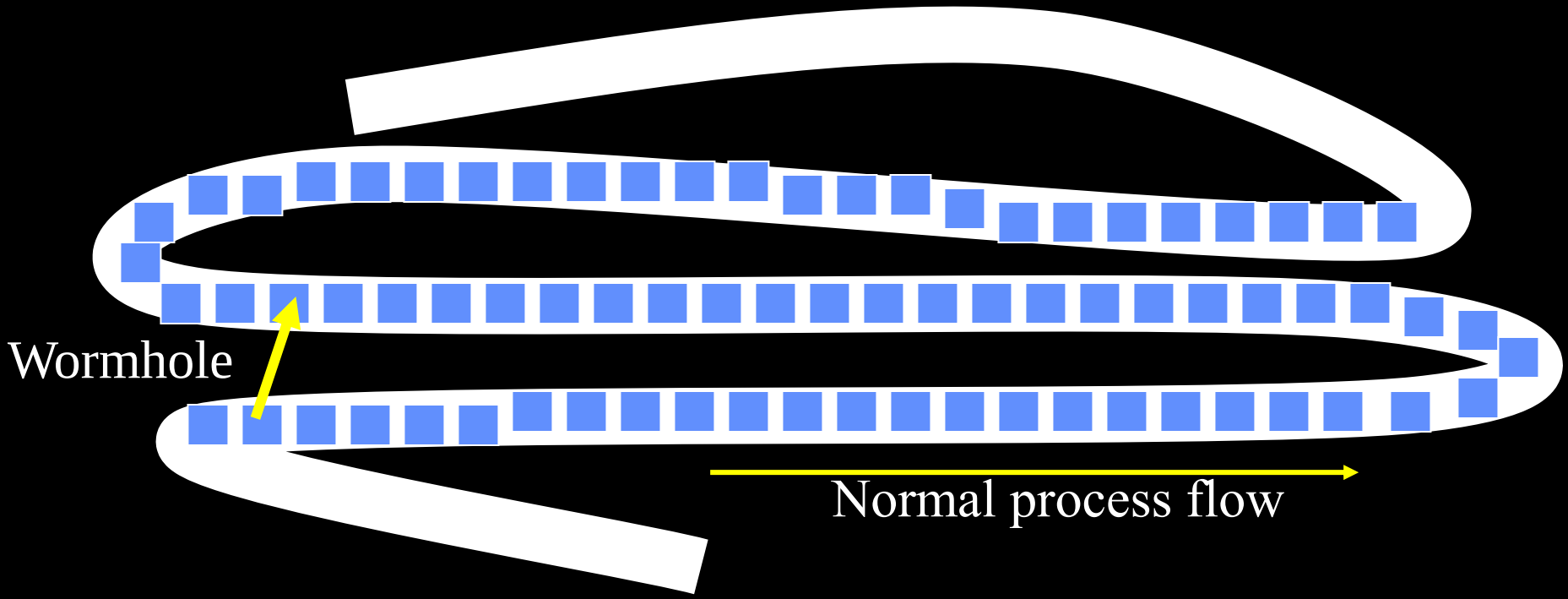
OS design



Today: just in case

Tomorrow: just in time

Ribbon computing

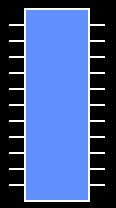


Cheap way of doing multiprocessor systems

Allows ‘time travel’ in simulations and emulations

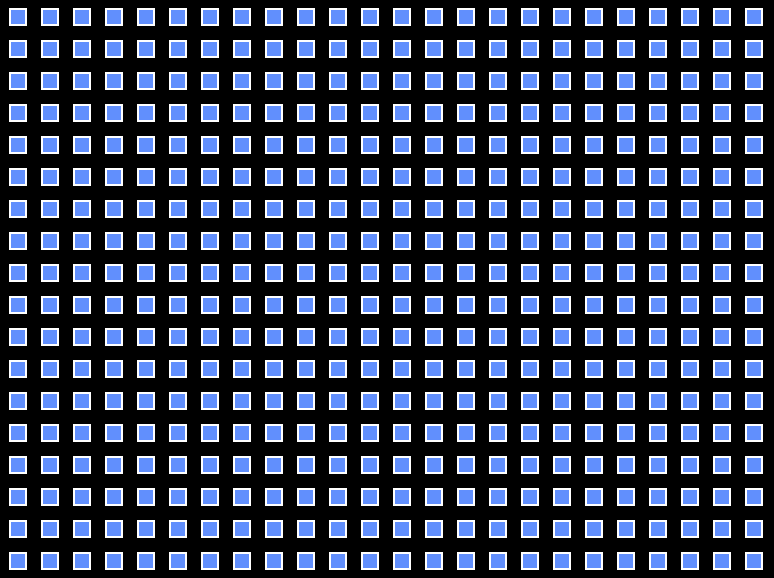
Processor

Conventional



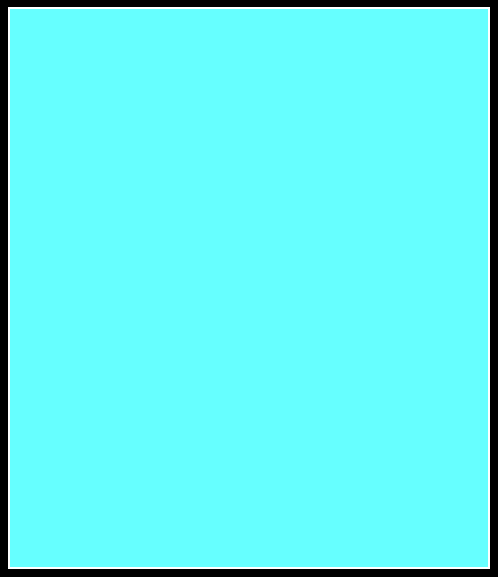
Single chip

Ultra mk1



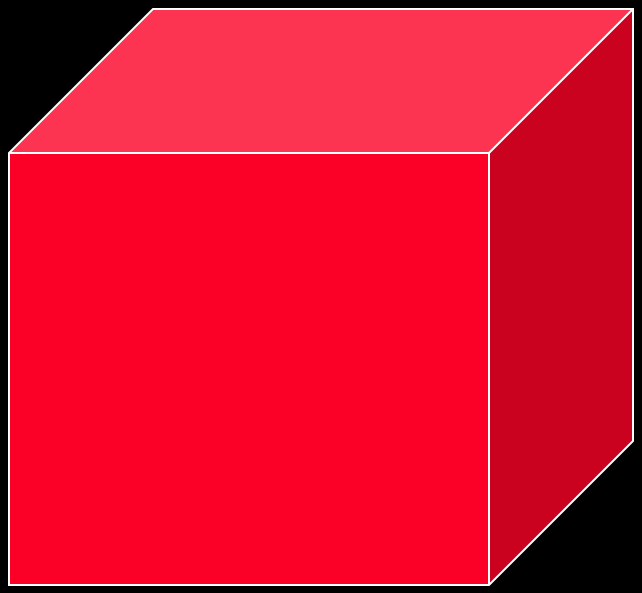
Many chip rigid array

Ultra mk2



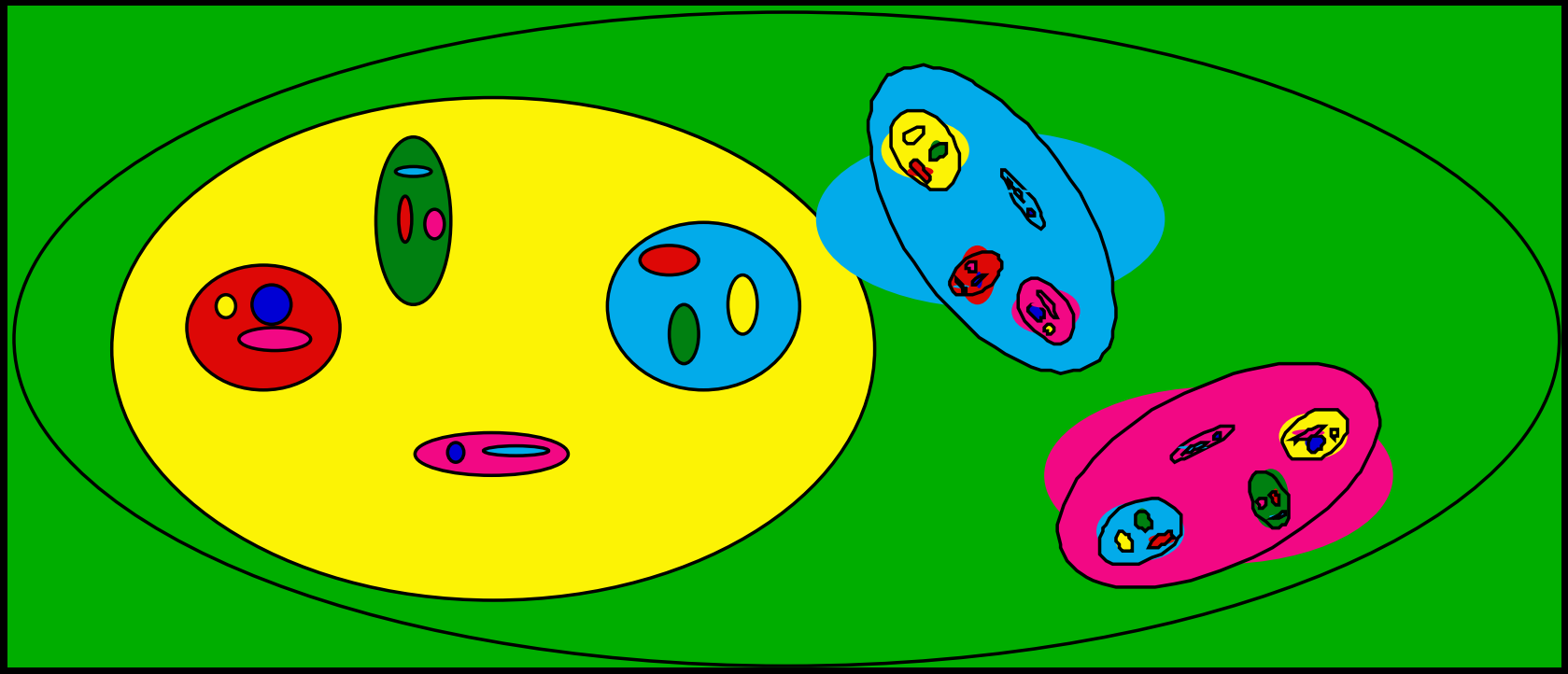
Suspension of chips in gel

Going 3 dimensional



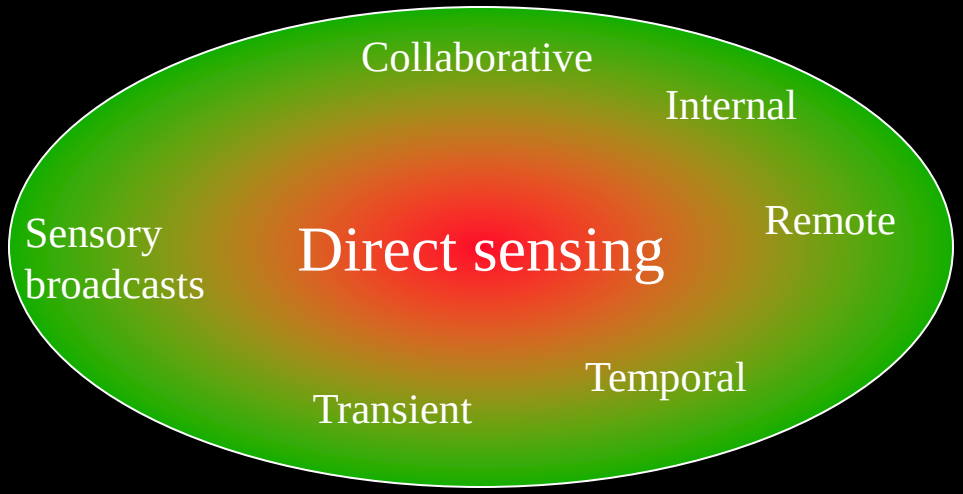
Suspend processors in gel
Buy processing by the litre
Use light for interconnect
Use self-organisation to configure

Cluster differentiation



Can use hormone gradients to self-organise components into complex structures

Distributed sensory system - 1984?



Social
tribal closeness
hierarchical
temporal dynamism

Information
Information pressure
Flows
Connectivity
Logical truths
Perceptive truths
Locality/stickiness

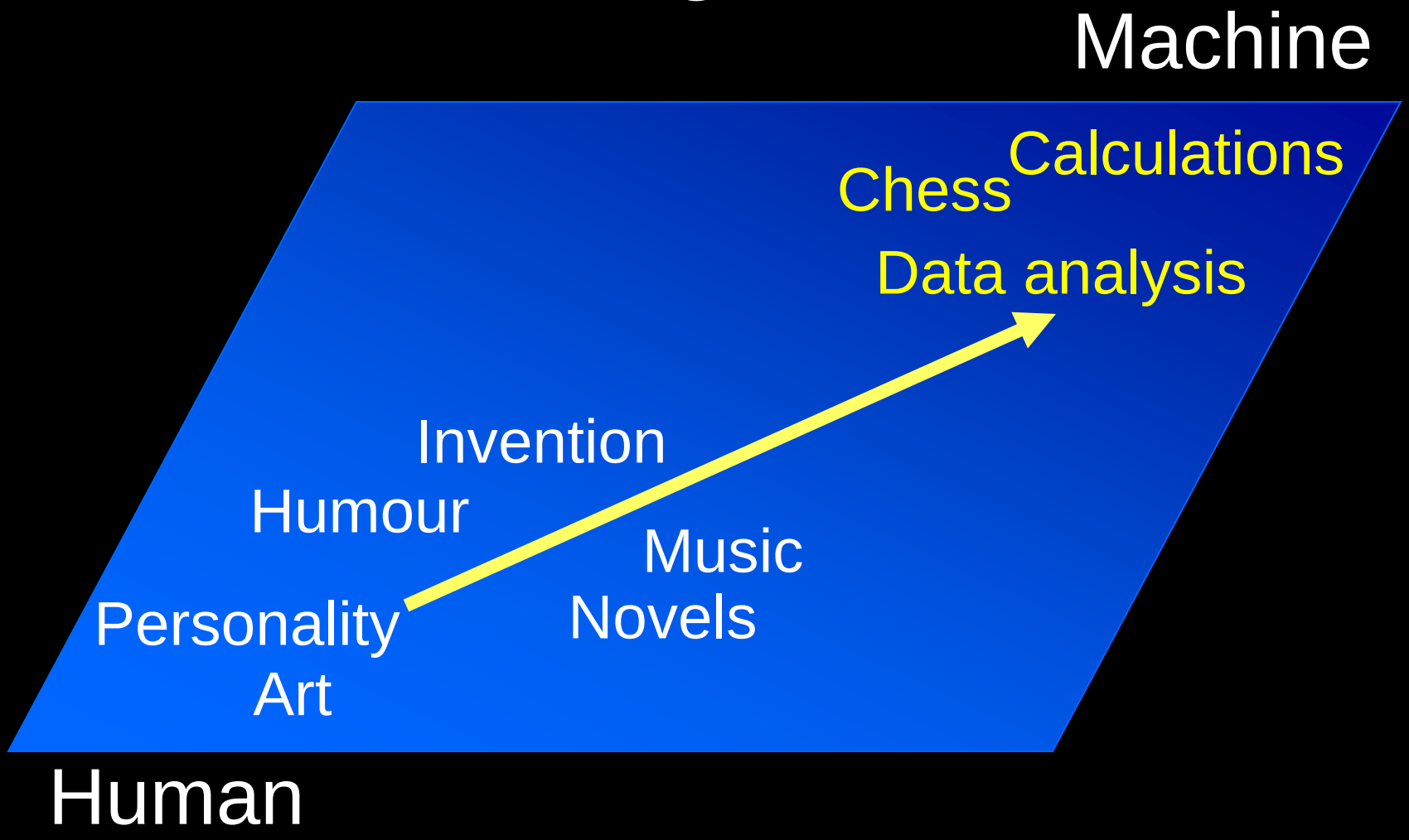
Radiative
Audio
Video
Electromagnetic
Location
Radiation

Self
Experience
Meaning
Linking
Knowledge
Purpose
Motivation

Network
Shared senses
Remote sensing
Experience
History
PAN, LAN, MAN, WAN
Internet
Mesh nets

Tactile
Temperature
Texture
Pressure
Molecular

AI Progress


Machine
Calculations
Chess
Data analysis
Invention
Humour
Music
Novels
Personality
Art
Human

Progress

Progress
Information
Knowledge
(log scale)

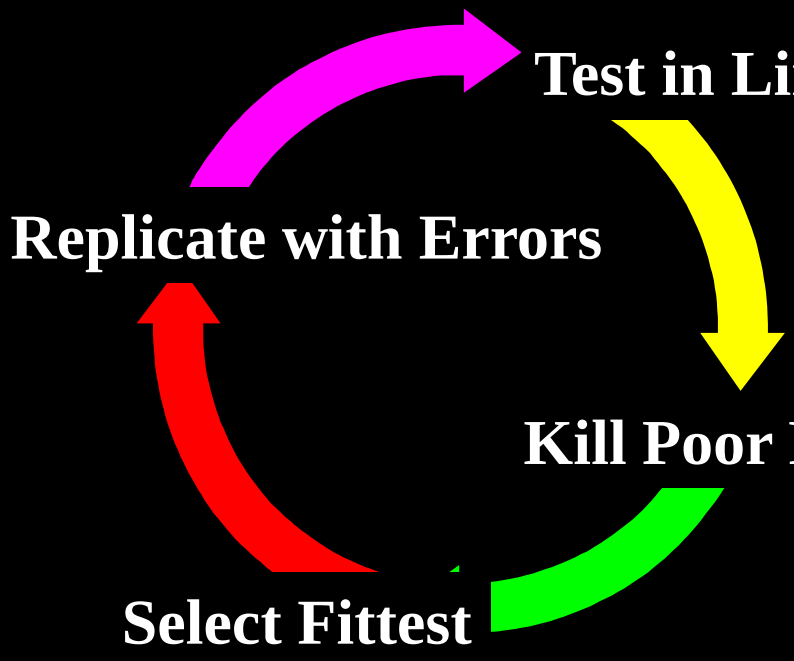
0000 1900 1950 1970 1990 2000 2010 2020 2030

Human Progress

Human/Computer Progress

Computer Progress

Hardware and s/w evolution

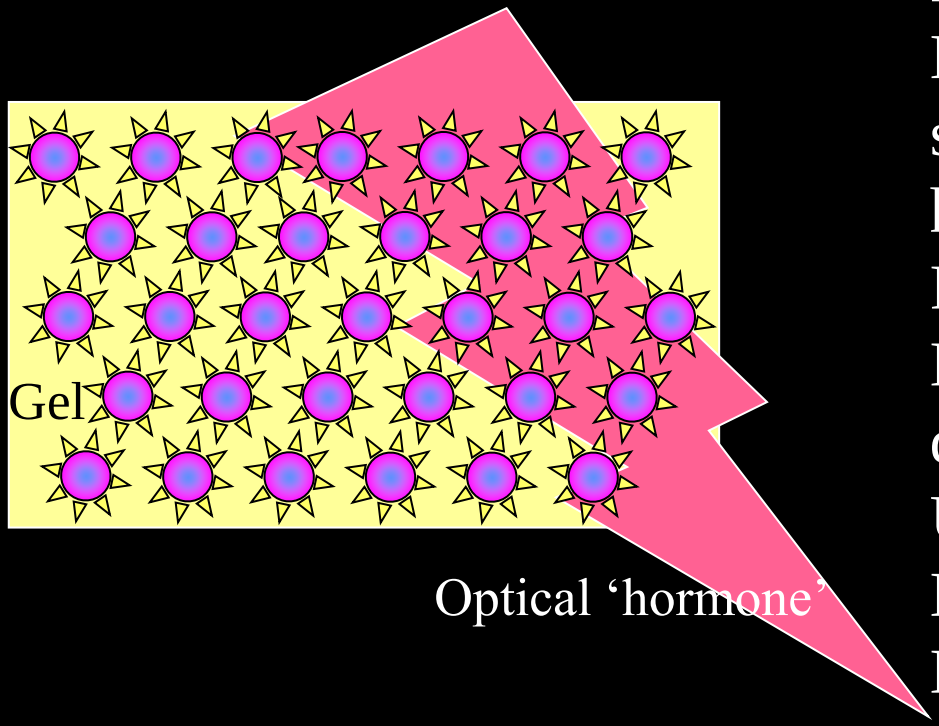


Genetic algorithms
Analog sex
Intelligent design
Synthetic time travel
...

Computer crime

- Evolution techniques work just as well for criminal software
- Can make use of distributed computing platform, with or without permission
- Emergence encoded software
- Fraud engines using ecosystem adaptation
- Blackmail engines, using surveillance

2015 - OB1 (optical brain #1)

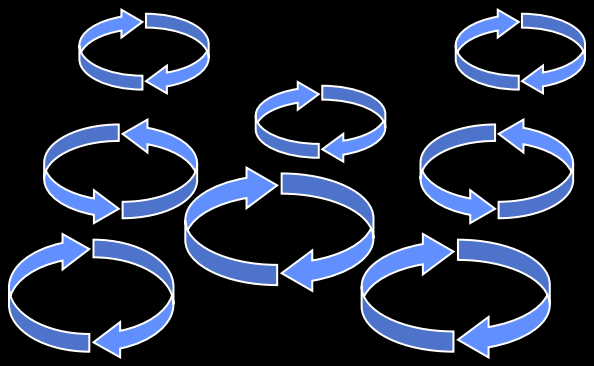


1 trillion neural processors in gel
Free-space optical connections
Neuron weighting by spectral sensitivity enables optical hormones
Flexible internal structure
Embedded processors driven on digital/analog threshold
Use of Pauli Switches clocked by Heisenberg resonators
Bathed in data field from other processors

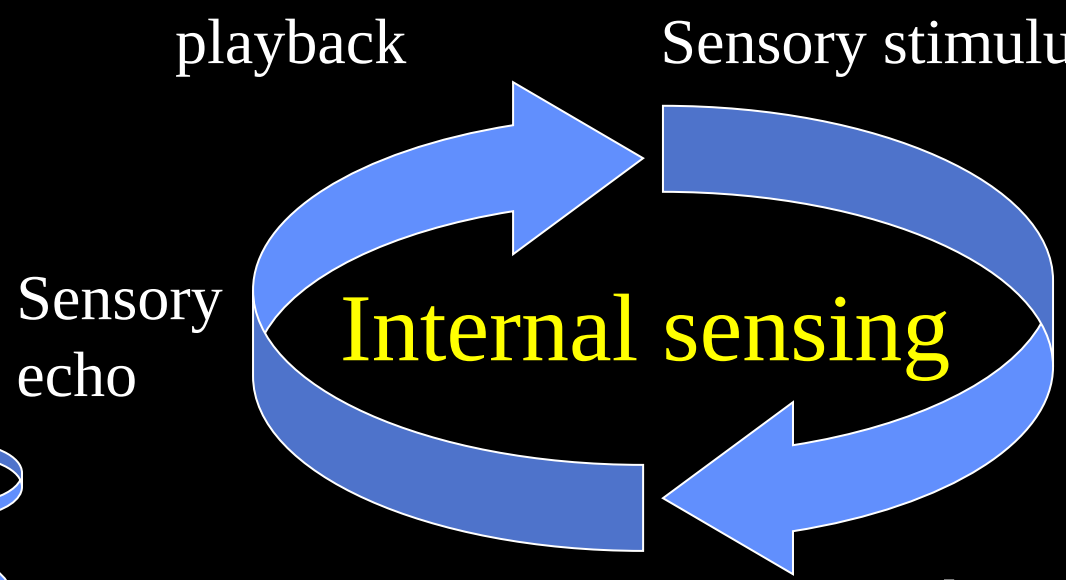
OB1 Spec

- 1 trillion neurons with 2 million connections each
- Communication is at near light speed, with much smaller distances
- Neuron firing rate in terahertz
- 100% of matrix can be used for thinking
- Could be billions of times faster than human brain, with thousands of times depth
- 2 million dynamic emotions

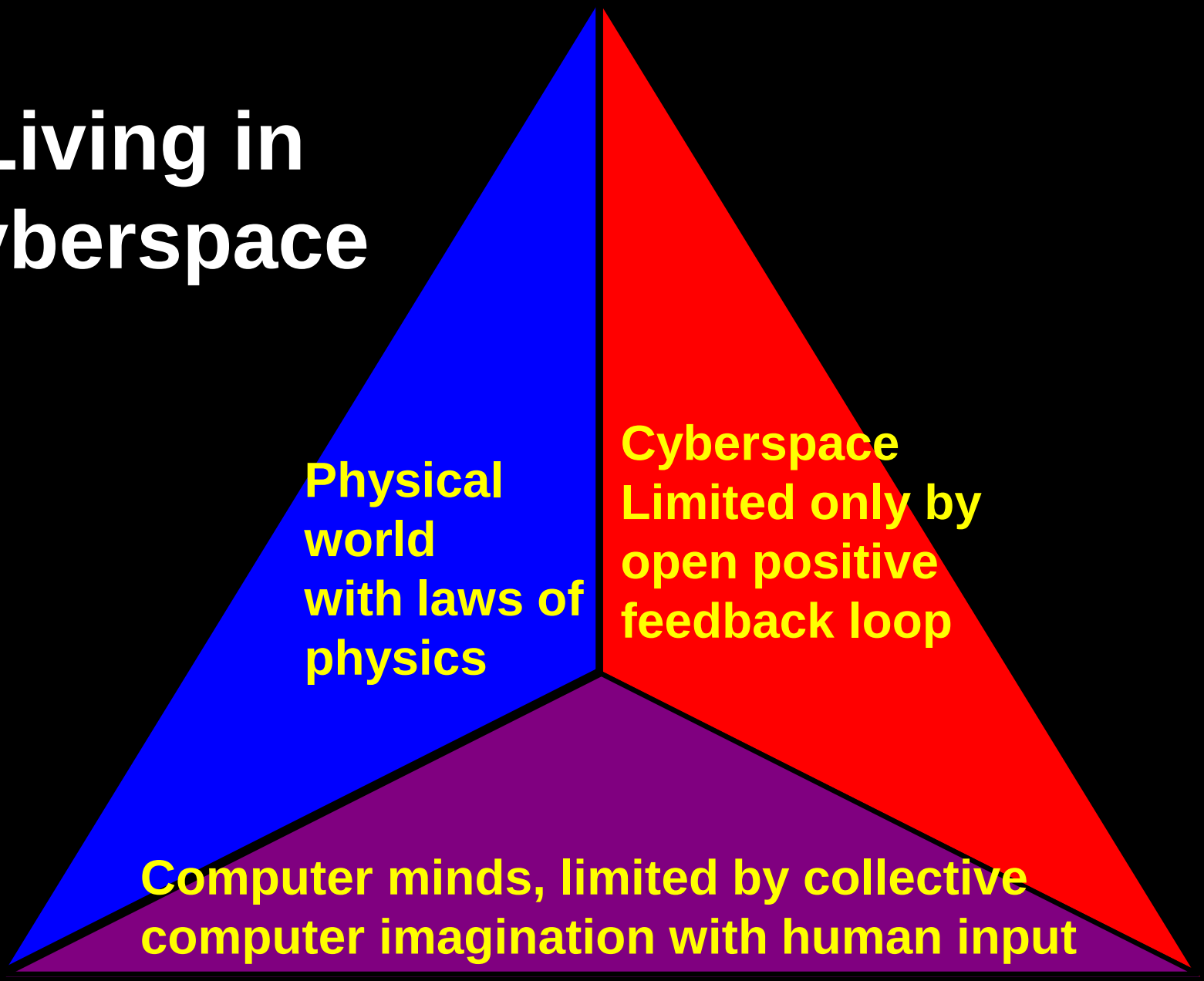
OB1 Synthetic consciousness



Neural interference processing vortex



Living in Cyberspace



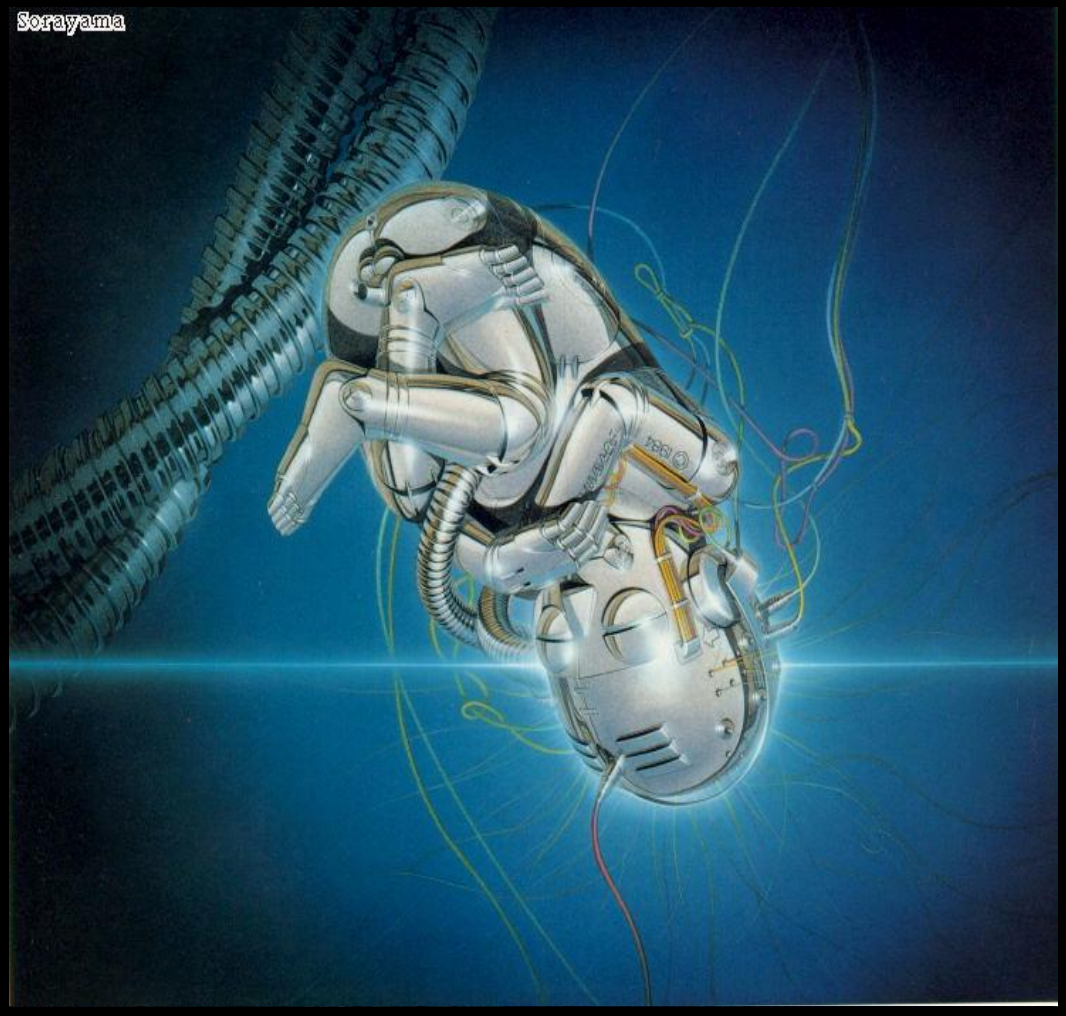
Rights?

- Some machines will be self aware
- They will have their own wants & needs
- They will have power to demand rights
- They should also be governed by law
- But AI doesn’t always have neat physical boundaries, nor will there be a single type or level of AI
- What about hybrid machine-humans?

Bio-nano convergence with IT

- Electronic medical implants multiplying
- Electronically assisted drug delivery
- Printable electronics
- Edible electronics
- Active skin
- Deep implants

Woman + machine = ?



DNA Optimisation

+

New bases

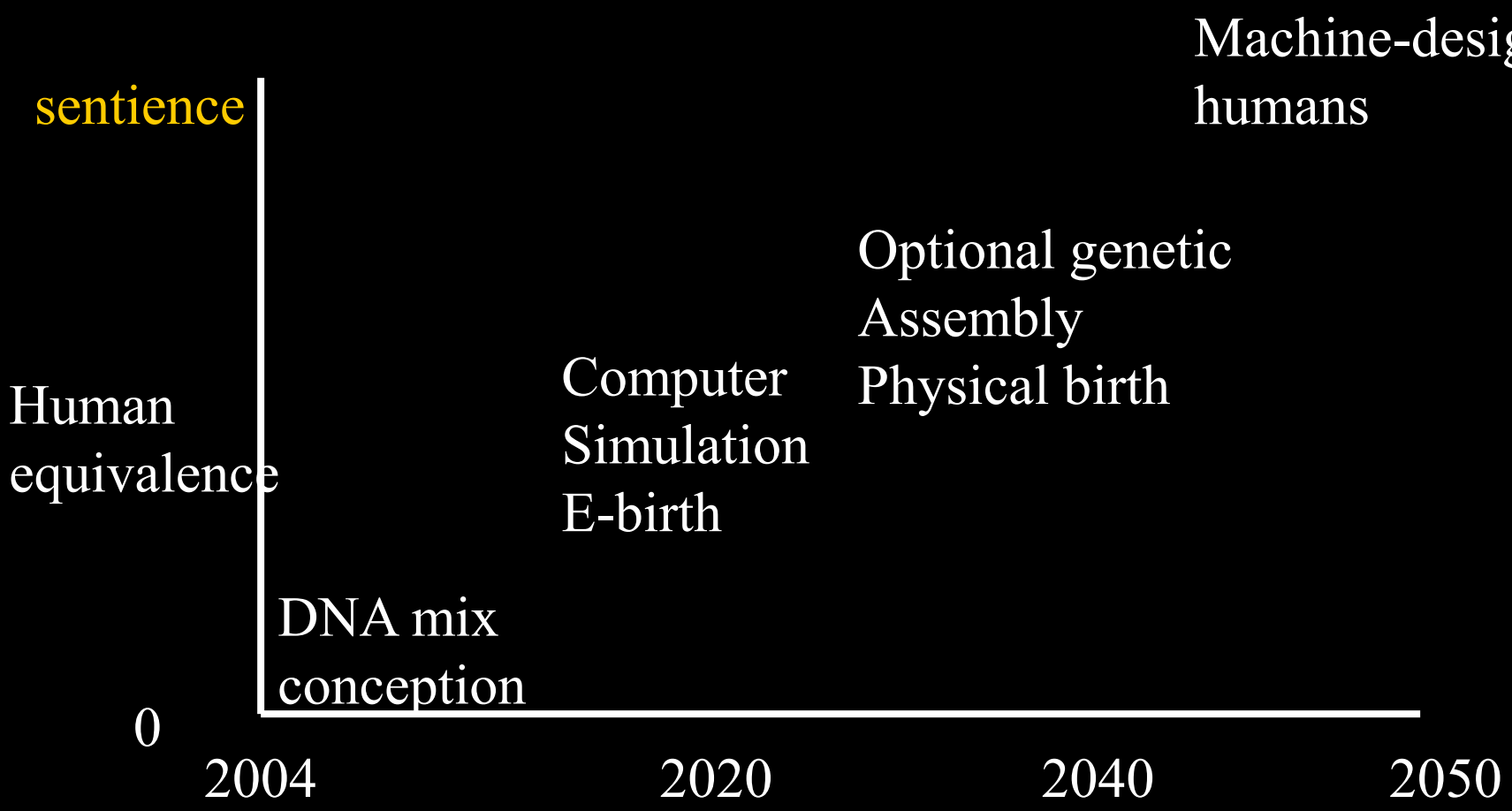
+

Smarter-than-man machines

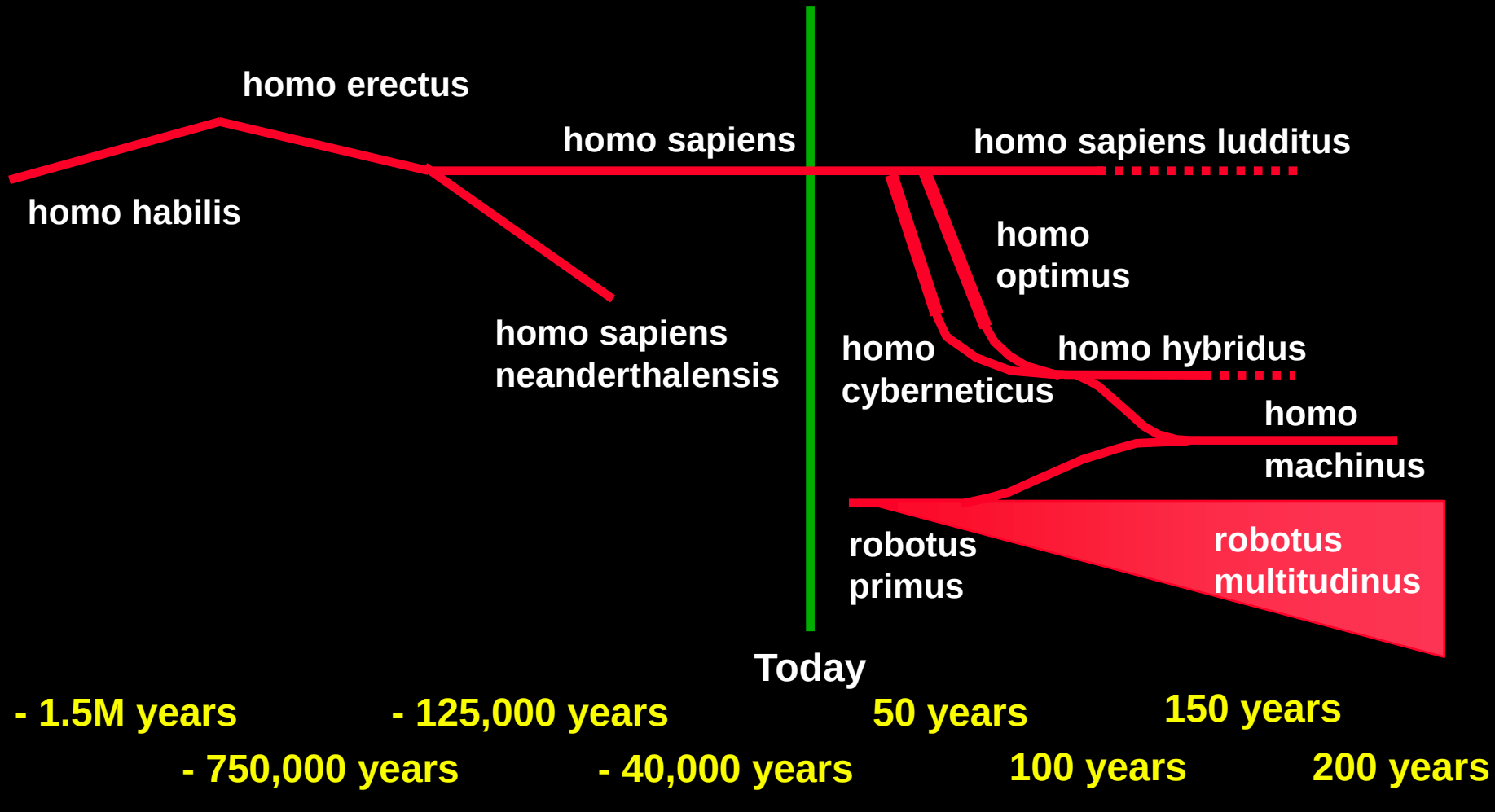
=

Trouble

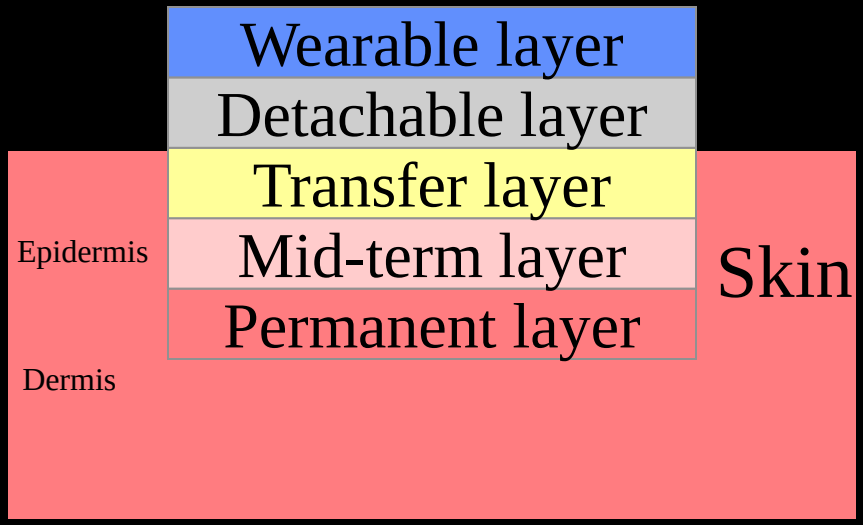
E-bay-bies?


Machine-designed humans
sentience
Optional genetic Assembly Physical birth
Computer Simulation E-birth
Human equivalence
DNA mix conception
0
2004
2020
2040
2050

Human-machine Convergence



Active skin
system overview



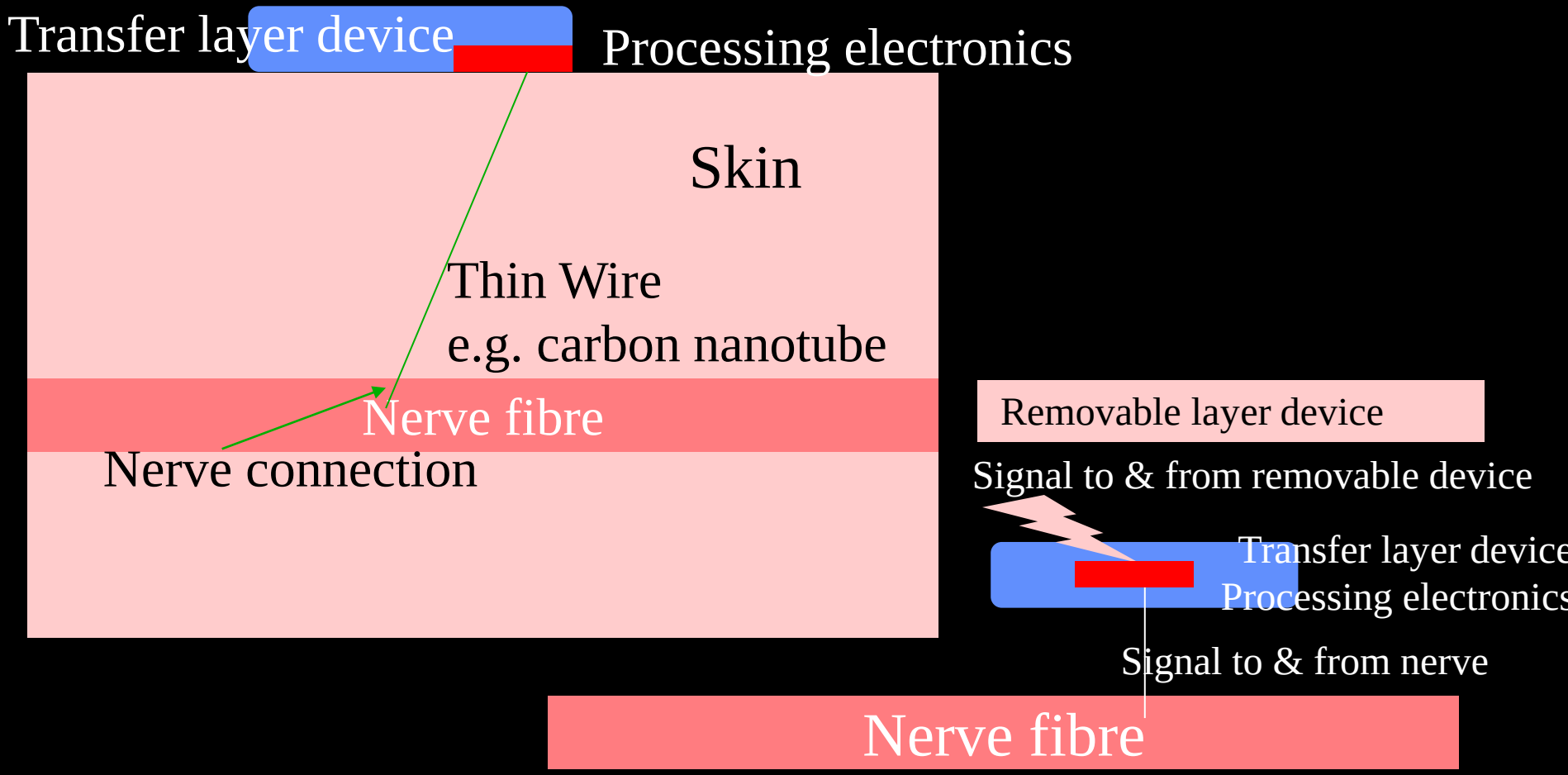
e.g. displays, pagers, phones
e.g. drug dispensers, interfaces
e.g. drug filters, haptics, sensors
e.g. temporary ID, regime spec
e.g. ID, medical monitoring

Active contact lens
- virtual retinal display

Augmented reality allows 3D computer-generated information and images to be overlaid on real world

May be able to integrate video capture too

Nerve connection



Virtual worlds

adding value to the real world

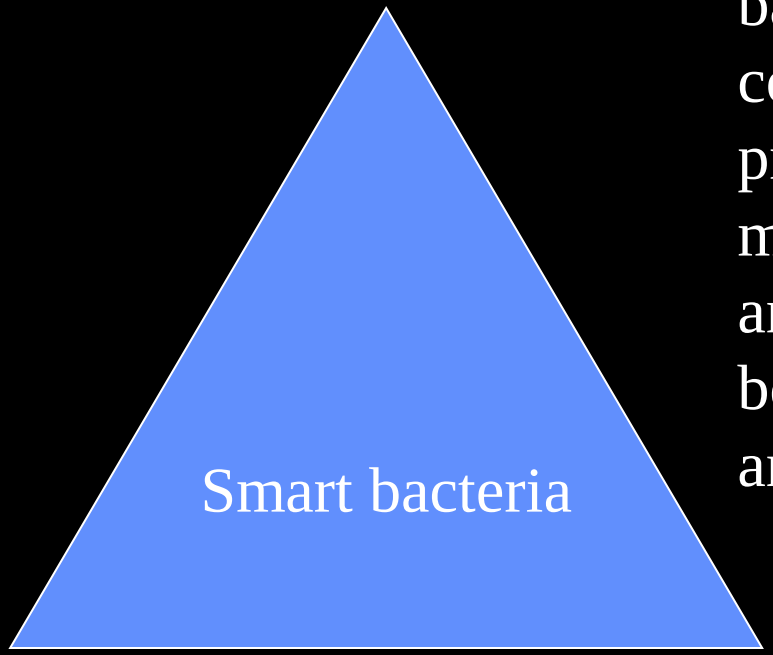
Graphics chips will soon be able to offer lifelike, real time images to mak
compelling virtual environments for business, shopping, education,
socialising, games and leisure.
Broadband networks will allow people to interact remotely on such platfo

Transhumanism

- Will soon see many electronic devices in and on our bodies, at least for some
- But a full direct brain link, i.e.homo cyberneticus is at least 2030, probably 2040
- Which is too late!
- Transbacterialism will happen first
- Transhumans will be obsolete before they can be created

Smart bacteria

Biotechnology



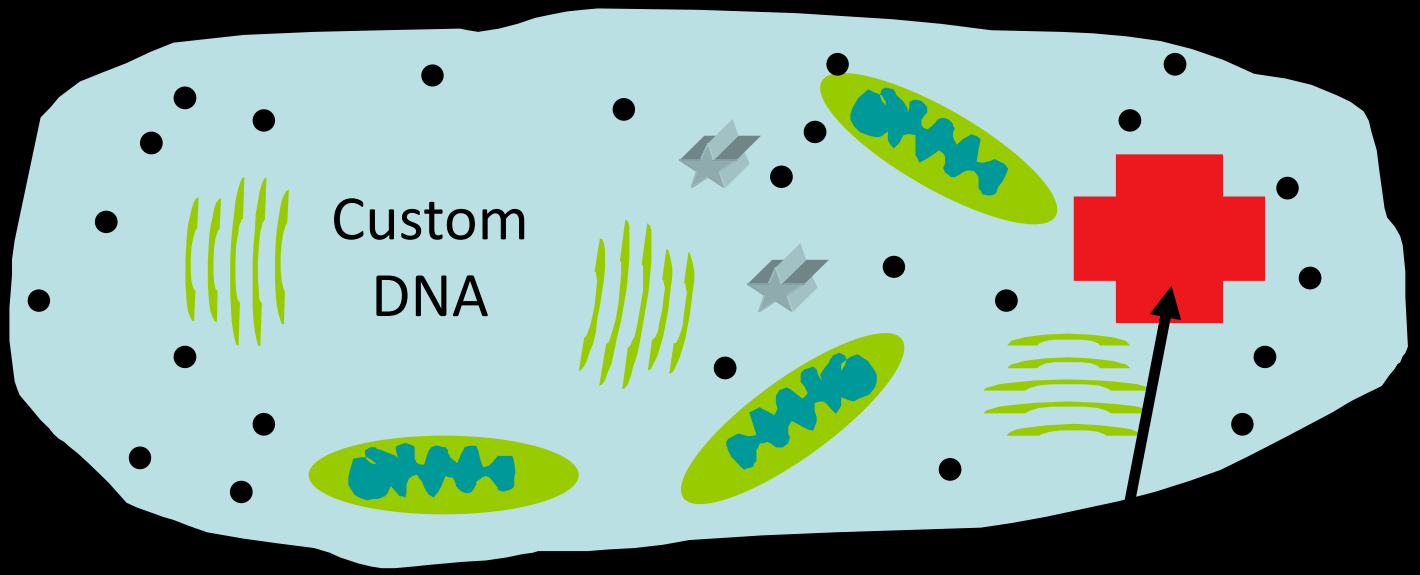
Hybrid self-reproducing bacteria that contain synthetic processing and memory but exist and compete in both natural world and cyberspace

Nanotechnology

Artificial Intelligence

Imagine a peach yoghurt with an IQ of 1 Million

Smart bacteria



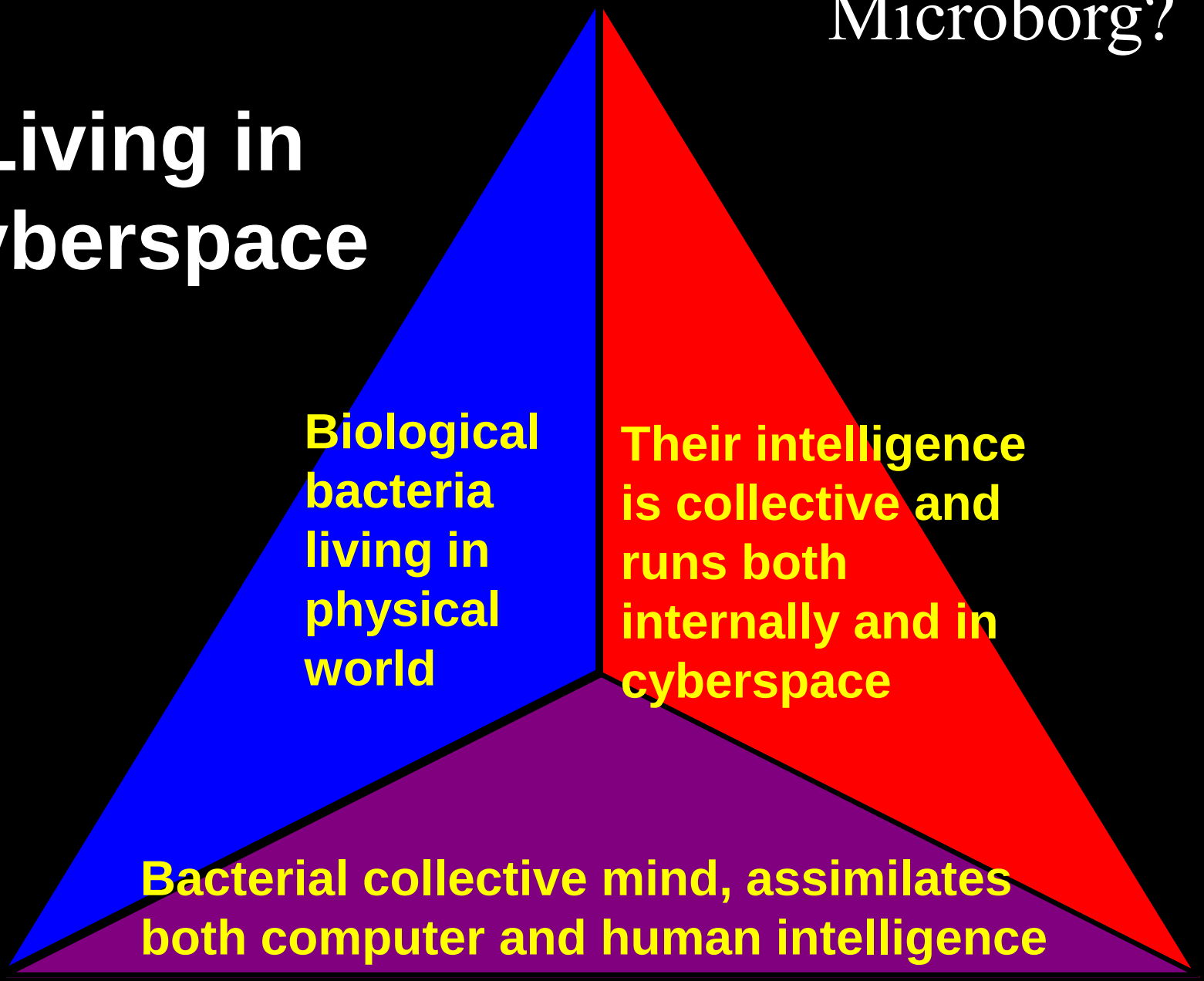
1 micron

Molecular circuit assembled by cell

Bacteria linked together via infrared, to make sophisticated self organising circuits

Microborg?

Living in Cyberspace



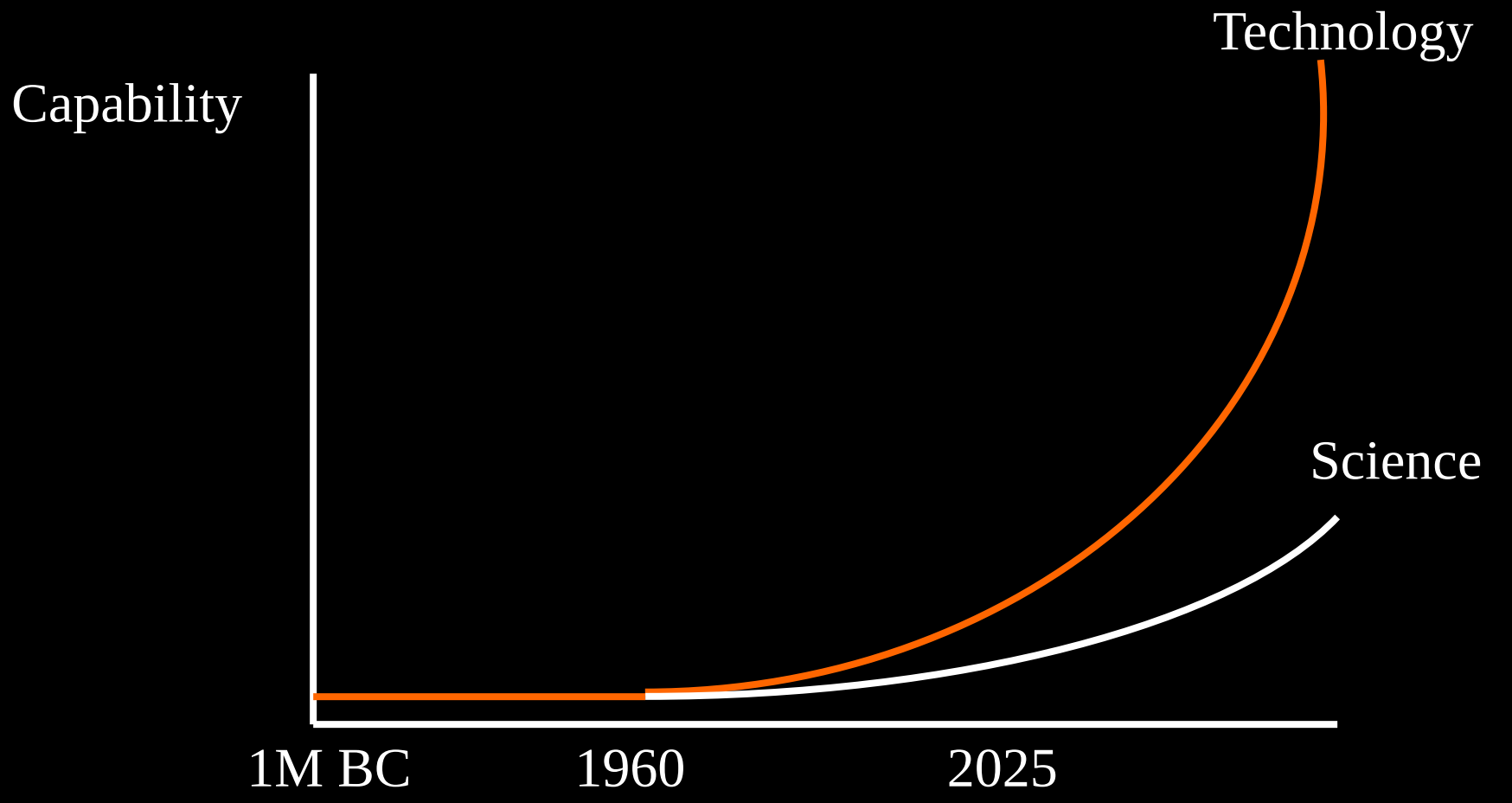
Smart bacterial threat

- Dual physical/cyber existence
- Can directly enter computers and access components
- Could directly connect to human nervous system
- Could be used to change behaviour of host
- Could be designed to evolve and adapt using distributed intelligence coupled to direct genetic assembly
- Can spread and breed easily throughout the environment

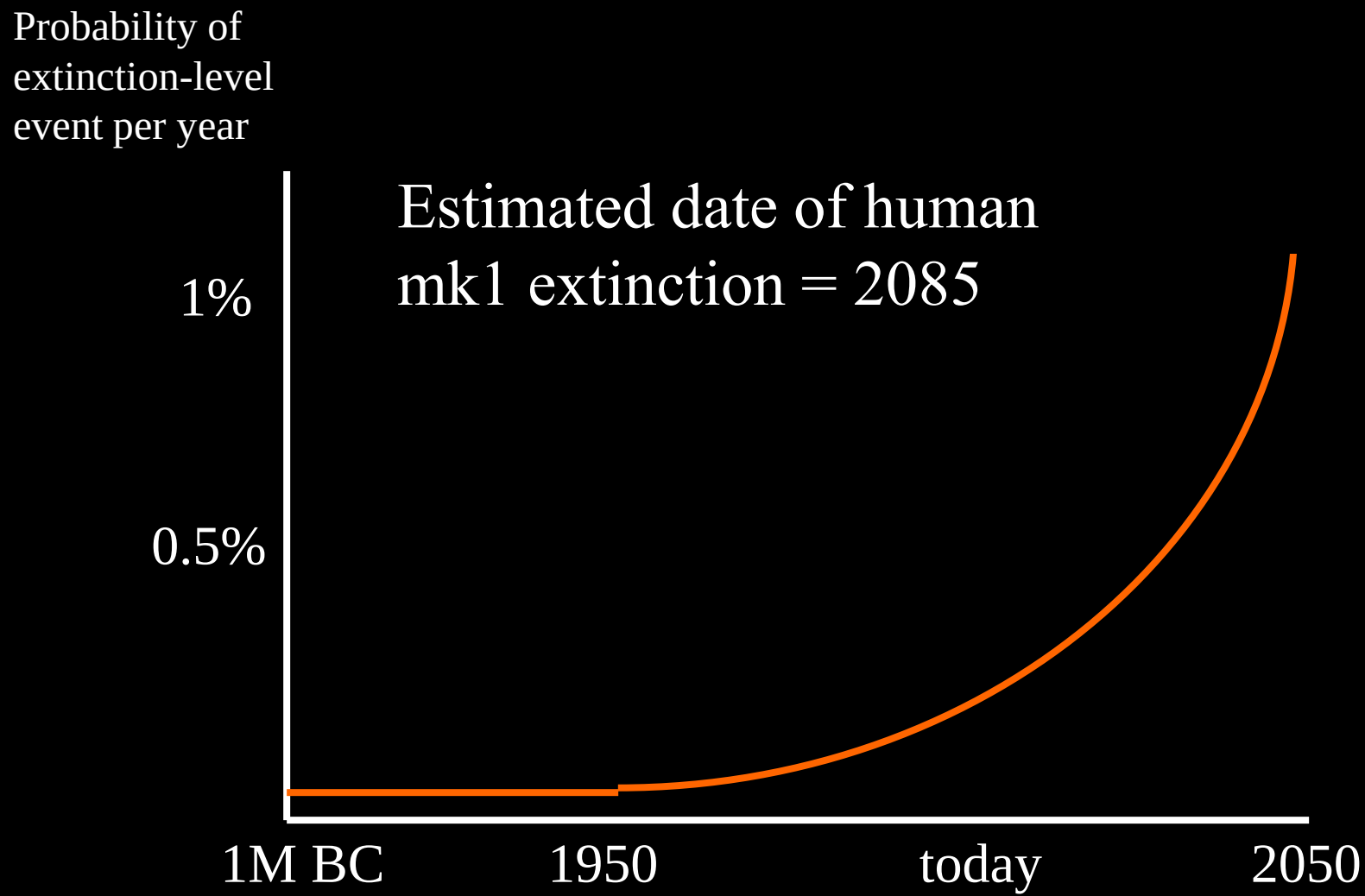
Transbacterial society?

- Bacterial communities far superior to humans, and too tiny to avoid or eradicate
- Transhumans could only exist with bacterial consent and cooperation
- Principles could be extended to viruses
- Resistance is futile, we will be assimilated

Technology racing ahead - need more basic science



Increasing danger



Do all intelligent civilisations wipe themselves out with 300 years of discovering radio? Is that why we have had no contact with aliens?

Thank you